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FOREST PEST MANAGEMENT
Pacific Southwest Region

Report No. 86-9

3420 Pest Management Evaluations
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MOUNTAIN PINE BEETLE ACTIVITY IN THREE STANDS OF LODGEPOLE PINE NEAR TRUCKEE, CALIFORNIA

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ABSTRACT

Three lodgepole pine stands on the Truckee Ranger District and adjacent to a residential development were examined for current and past activity of the mountain pine beetle, Dendroctonus ponderosae. Activity has been chronic in most of the area, and one stand contained many green trees with live brood. Old Jeffrey pine and white fir stumps with signs or symptoms of annosus root disease were common. Six management alternatives ranging from no action to management of annosus root disease are discussed.

INTRODUCTION

Mountain pine beetles, Dendroctonus ponderosae Hopkins, have been attacking lodgepole pine southwest of Prosser Lake for several years. Dead pine have been salvaged from three stands on public land (Fig. 1) and sold in firewood sales. This reclaims some of the value lost, but it does not address the conditions pertinent to management of these stands that would alleviate losses and improve tree and stand vigor. The Truckee Ranger District, Tahoe National Forest, therefore requested a pest management evaluation as part of an overall environmental assessment of management alternatives for these stands, which are adjacent to a private residential development to the south and a public recreation area to the north. We met with personnel from the District on May 6 and surveys and examinations were conducted May 6-8, 1986.

DESCRIPTION

The three stands are located two miles north of Truckee, California, via State Route 89 (Fig. 1). Elevation is 5800 ft, aspect is northeast and slope is generally 10%. Stands 389 and 391 are Dunning Site Class IV and consist of small sawtimber lodgepole pine, with minor components of white fir, ponderosa and Jeffrey pine. Stand 388 is a Dunning V and has a small component of Jeffrey pine. Aggregation descriptions from a recent cruise are given in Table 1. The larger trees of all species are about the same age, 120 years, with the last 40 years producing only one inch of radial growth for the lodgepole pine.

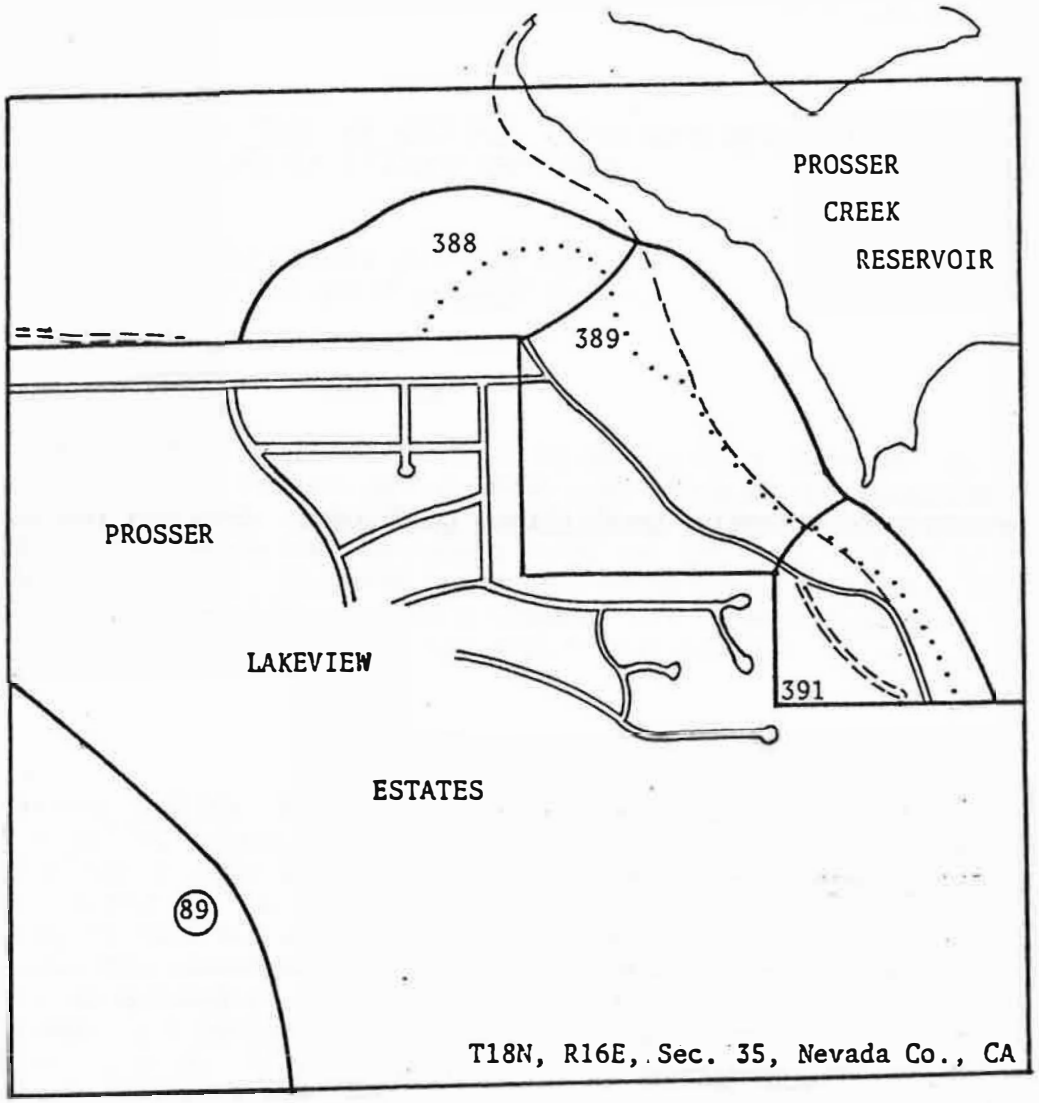

Figure 1. Three stands near Truckee, California where mountain pine beetle is causing mortality of lodgepole pine. The dotted line and property lines enclose the area where most of the spot infestations occur.

Radial growth of the white fir was about twice that of the lodgepole for the same period. The last recorded infestation in the Prosser Creek drainage was in 1964. Thus, the Prosser stands have all the characteristics of a highly susceptible stand: dbh greater than 8", greater than 80 years of age, a pure or nearly pure lodgepole type for much of the area, an elevation and latitude conducive to population increase, and a history of infestation.

Table 1. Aggregation description from the stand record cards of three stands of lodgepole pine, Truckee District, Tahoe National Forest

Stand Characteristics	Stand No. 388	389	391
Basal Area/ac (ft^2)	216	230	333
Height (ft)	52	85	73
dbh (in)	15	21	14
Stems/ac	188	96	312
Growth (ft^3/ac)	81	98	81
Age (yrs)	96	122	117
Stratum	L3N	L3G	L3G
Area (ac)	25	37	24

The area was logged in the 1870's and one of the railroad grades used is shown as a single dashed line in Figure 1. Many Jeffrey pine stumps remain from this era. Lodgepole pine stumps available for examination are the result of cutting within the most recent decade. During this time, winter and spring (January through May) precipitation was often below normal, particularly in 1984 and 1985. Annual precipitation was below normal for eight of ten seasons, 1970-71 through 1980-81. The trees should have been substantially stressed during the beetle flight period and therefore, favorable hosts for successful attack. This stress is indicated by the loss of the top three to five whorls on many pines in these stands.

METHODS

Cruise strips one chain wide were begun two chains north of the southwest corner of each stand and run east to west. Whenever a dead or green-infested lodgepole pine was encountered along the line, a variable plot sample (20 factor) was established at the center line at a right angle to the specimen tree. All trees greater than 4.5 inches dbh were tallied and classified as uninfested, attacked in 1985, attacked in 1984, or attacked in 1983 or before. Trees that had repulsed, "pitched-out", attacking beetles also were recorded. Presence or absence of brood, presence of parent adults, emergence holes, blue stain, phloem and sapwood disintegration, and needle fall were used to age tree mortality by the years indicated.

Two strips were run in stand 388, five in stand 389 and three in stand 391. Thus, 22% of the area was traversed — 20% for 388, 25% for 389, and 19% for 391.

Most of the stumps within the strips, and many outside, were examined for signs and symptoms of annosus root disease. The Jeffrey pine and white fir stumps were present from logging many years ago, and therefore, were relatively well-broken down and decayed. In contrast, most lodgepole pine stumps were created three to seven years ago, when the trees were killed by the mountain pine beetle and cut for fuelwood. These hard, non-decayed stumps would not enable fruiting bodies of F. annosus to have formed if colonization had occurred.

To determine if recently created lodgepole pine stumps were colonized, discs were cut with a chain saw from stumps in four locations, including the areas with identified annosus centers. The surface 1/2" was removed, and then two consecutive 1/2" thick discs were cut from each stump. The discs were incubated in the laboratory and examined after one and two weeks for the presence of the fungus.

RESULTS

Mountain Pine Beetle

The cruise for infestation data did not always yield basal area and average diameters in close agreement with the previous district cruise (Table 2). Different methodology and prism factors are thought to account for the differences. In general however, the stands are overstocked, with the exception of the western half of stand 388.

Table 2. Average diameters and basal areas for three stands of lodgepole pine, Truckee District, Tahoe National Forest

Stand:	388		389		391	
	dbh	BA	dbh	BA	dbh	BA
District Cruise (Table 1)	15	216	21	230	14	333
MPB Cruise (range)	13.8	148 (60-260)	13.4	275 (160-340)	14.4	210 (160-260)

The dotted line and property lines of Figure 1 enclose the area where most of the spot infestations occur. Overall, more pines were attacked in 1985 than in previous years (Table 3). Basal area per dead tree also increased. The number of sample points initiated by encountering trees with 1985 attacks was about twice the number of points initiated by encountering attacks from previous years. The average diameter of attacked trees has increased slightly over time (Table 4). Increases in diameter and basal area indicate that more bole area contributed to brood production in 1985. Good brood survival in the thick phloem of these pines suggest a greater beetle population in 1986 than in previous years.

Table 3. Characteristics of lodgepole pine attacked by mountain pine beetle in three stands, Truckee District, Tahoe National Forest

	1985	1984	1983+*	Pitch-out
No. Dead Pines	27	21	23	3
Total BA Killed (ft^2)	38.4	20.7	25.7	9.1
BA/Dead Pine	1.4	1.0	1.2	3.0

* = 1983 + years prior to 1983.

Stand 389 is largely responsible for these trends because most of the 1985 attacks were located in this stand (Table 4). Many potential "bug" trees remain in each stand — 63.5% of the uninfested lodgepole and ponderosa pines are greater than 12 inches dbh and have a phloem thickness of 2.3 mm or more. Phloem of 4.6 mm is not uncommon in some parts of stand 388. Thick phloem in attacked trees can result in good brood survival and rapid population increase.

Table 4. Average dbh of lodgepole and ponderosa pine in three stands near Prosser Creek, Truckee District, Tahoe National Forest

Stand No.	Uninfested	Attacked by Mountain Pine Beetle 1985	1984	1983+*
388	11.8 (35)	19.6 (03)	12.5 (07)	15.6 (06)
389	13.1 (77)	14.8 (19)	14.0 (02)	11.2 (05)
391	14.1 (52)	13.6 (05)	14.2 (11)	13.8 (12)
All stands	13.1	15.1**	13.6	13.7

() = No. of trees.
* = 1983 + years prior to 1983.
** 14.5 for #389 + #391 only.

Annosus Root Disease

The stumps of some Jeffrey pine and white fir had typical annosus decay, but only stumps with conks of the pathogen were recorded as positive (Table 5). Frequency (%) of stumps colonized was about what would be expected from surveys in other stands in the Sierra Nevada.

Table 5. Frequency of F. annosus colonization of stumps in three lodgepole pine stands, Truckee District, Tahoe National Forest

Species	Total Number of Stumps Examined	F. annosus Conks Present	
		Number	Percent
Jeffrey pine	63	12	19
Lodgepole pine	66	0	0
White fir	6	4	67
TOTAL	135	16	12

If the area surveyed was representative, about one infested stump per acre was present. However, infested stumps were concentrated rather than randomly distributed. None were found in 388; most were in 389 and a few were in 391. One old, inactive annosus center, about 1/4 acre in size and with no recent mortality, and one smaller center with a recently dead white fir, were present in the western portion of 389.

F. annosus was present in some of the discs removed from non-decayed lodgepole stumps (Table 6). Because most of the lodgepole pine stumps sampled were created when dead trees were cut, colonization by F. annosus was not expected to be common. Many of the discs were colonized by blue stain fungi. Blue stain, plus other saprophytic fungi colonizing dead tissues, would compete with F. annosus and make colonization difficult. Annosus infection of stumps created when live trees are cut would probably be greater.

Table 6. Colonization of lodgepole pine stumps by F. annosus in lodgepole pine stands 389 and 391 on the Truckee District, Tahoe National Forest

Location	Lodgepole Pine Stumps	
	No. Sampled	No. with Fomes
1	4	1
2	5	0
3	5	1
4	4	0

DISCUSSION

Prospects for 1986 are for a larger beetle population than in previous years. This generation of mountain pine beetles will emerge into stands that remain highly susceptible to this insect because of overstocking, poor tree vigor, annosus root disease, and a high percentage of large lodgepole pines with thick phloem. The recent chronic tree moratlity is likely to continue until these stand conditions are altered either by natural successionary forces including beetles and F. annosus, or planned management activities. The former may be incompatible with management objectives; the latter may be preferable in spite of the investments required.

Any management activities should have as their goal the general concept of minimizing mountain pine beetle damage to lodgepole pine by maintaining healthy, vigorous and fast-growing stands, more or less regardless of age. It is not necessary to grow small-diameter trees with thin phloem in order to avoid damage from the mountain pine beetle. With intensive management, lodgepole pine can probably be grown to small sawtimber without significant loss from mountain pine beetles (Executive Summary, State-of-the-Art: Lodgepole Pine/Mountain Pine Beetle Management, Canada/U.S. Lodgepole Pine/Mountain Pine Beetle Program).

MANAGEMENT ALTERNATIVES

1. **Do Nothing.** The mountain pine beetle will remain active in the stands, very likely in increasing numbers. Once the beetle greatly reduces the stocking and eliminates the larger trees with the thick phloem that result in high progeny production, the infestation will decline. This will take several more years to occur; just how long is hard to say for the infestation is not yet widespread. Only low temperatures atypical of Truckee could terminate the infestation under current stand conditions. However, stand conditions would remain unaltered and the beetle population would soon return to previous levels. The result will be increasing numbers of holes in the stands and standing dead pines. Additional lodgepole mortality can be expected in adjacent moderate- to high-risk unmanaged stands.

2. **Salvage Logging.** Value in the form of firewood sales would be realized, but the underlying causes of stand/tree susceptibility to attack would not be addressed. The insects would continue to dictate which trees would be harvested and the extent of the harvest until they have eliminated most of the larger diameter classes.

3. **Direct Control.**

"The objective of direct control is to reduce beetle numbers to levels that do not cause economically important damage, or to reduce the rate of population expansion in order to implement a longer-term solution" (McMullen et al. 1986). There is no general agreement among scientists and foresters regarding the effectiveness of direct control in reducing losses. Nevertheless, there may be limited application to the Prosser stands until long-term prevention management can be enacted. However, certain disadvantages should be

recognized. The Prosser stands are not isolated from other sources of infestation. Once begun, successful direct control must continue as long as there is evidence of beetle activity as indicated by yearly surveillance. It is difficult to detect every green infested tree even in small areas, and the success of direct control is dependent upon the thoroughness in all aspects of treatment application and of surveillance. Finally, the mountain pine beetle will remain a threat to a susceptible stand even with successful control unless conditions creating the susceptibility are alleviated by long-term management.

a. **Sanitation Logging.** The removal of infested trees for utilization, which kills the beetles, is the most commonly used method of direct control. It would appear suitable in the Prosser stands because the area is small, readily accessible and a limited number of trees are involved.

b. **Pile and Burn.** The infested portions of currently infested trees could be cut into short lengths, piled on the stumps, and burned until the bark is completely charred on all logs. This brood-killing technique is time-consuming and restricted by fire hazard conditions, but is very adaptable to winter conditions.

c. **Peel.** Infested trees can be felled and the bark peeled from the boles while the broods are in the larval and pupal stages. The bark is more easily removed in the spring than the winter. The bark can be either burned or placed in the sun to quickly desiccate. Crews from the Nevada Department of Corrections were recently used for applying this method to an infestation of Jeffrey pine beetle at South Lake Tahoe.

d. **Insecticide Treatment.** Infested trees could be felled, bucked if necessary, and the infested bole area sprayed uniformly to drip point with a bark-penetrating solution of insecticide in fuel oil. Dursban™ and lindane are available for use (see Appendix I for specimen labels and example "Special Local Need").

Many types of spray equipment can be used as long as the parts are resistant to the oil and the nozzle delivers a cone-shaped or fan-shaped spray. Fuel oil alone is also an effective treatment when sprayed to drip point on infested logs which are then tightly covered with plastic sheeting (McMullen et al. 1986).

Application also can be made on standing trees. The equipment should be capable of spraying to 30 ft high on the bole, which means approximately 80 psi pump pressure. This technique is more unwieldy than spraying felled trees and a great deal more spray can hit non-target surfaces.

Spraying felled or upright infested trees is best carried out in the spring or early summer before the emergence and flight period. Infested trees are easier to find because of faded foliage and weathering and woodpecker activity will have provided cracks and holes in the bark that aid penetration.

Sevinmol™ 4 carbaryl insecticide can be used as an economically sound preventative treatment when the number of standing, infested trees to be treated is low and their value high (see Appendix I). Removal of infested trees and the destruction of the broods before flight would still be advisable to increase the probability of survival of treated trees.

4. Preflight Pheromone Trapping

a. Tree Baiting. This methodology is not presently available because the registration requirements are currently under review by the EPA. However, it may be available for use next year. Baiting of uninfested, untreated or pesticide-treated trap trees has two purposes: to trap and kill flying beetles attracted to the trap, and to serve as a nucleus for a spot infestation that can be treated later (McMullen et al. 1986). The general procedures of how to use semiochemicals are contained in the Technical Bulletin by Phero Tech. Inc.[1] (Phero Tech. 1985) and an example is given in Borden et al. (1983).

Tree baiting is highly effective in inducing beetles to attack selected trees. This increases the effectiveness and feasibility of the direct control methods previously mentioned. The tree must be baited prior to beetle flight and should be at least 10-12" dbh in the Prosser stands. The commercially available lures containing three chemicals are attached to the tree on the north side and above the understory canopy.

Lethal trap trees are prepared by thoroughly spraying boles to the drip point to a height of 15 ft with a nonpenetrating insecticide. A preparation of 2% a.i. carbaryl in water prepared from Sevin™ SL is usually effective in killing the beetles attracted to the baited trees (McMullen et al. 1986). Baited trees untreated with insecticide are also effective traps but generally trap fewer beetles than lethal trap trees and the likelihood of attacks on adjacent treesis greater than with lethal trap trees. There also is the disadvantage that infested trap trees and any adjacent attacked trees must be treated following attack to kill beetles and their broods.

b. Funnel Trapping. Funnel trapping is another technique for manipulating mountain pine beetle populations. The traps absorb nearby populations without the tree mortality associated with trap trees. The method apparently does not require registration, but the strategy needs more research and development. Results in Canada have been encouraging. However, the use of funnel traps in stand conditions such as Prosser is only a delaying tactic until long-term management actions, such as thinning, can be implemented.

5. Preventive Management

a. Thin. The harvest of the stands would eliminate the problem and financial returns would be realized. However, the objective of retaining forest cover and screening would be sacrificed. Thinning could be used to reduce stocking and remove the larger trees that characterize susceptible stands. Cover would be retained, a firewood sale realized, and the stand converted to a less susceptible condition.

Selectively removing trees on the basis of diameter and phloem thickness is one way to effectively reduce bark beetle hazard, eg. removal of pines greater than 14" dbh at Prosser Creek. However, this type of "high grading" may not be an acceptable practice. Basal area and improvement leave cuts (thinning from below) will effectively reduce or minimize loss and may be more acceptable.

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1. The mention of products does not imply endorsement by the USDA-Forest Service, nor does the exclusion of certain products imply disapproval.

The stand record card projections of 140 BA after thinning seem about right for stands 389 and 391. Stand 388 would be thinnned to about 110 sq ft.

Thinning, once started in older stands containing large diameter, thick-phloemed pines, must be carefully planned and faithfully carried out until the stands are replaced by regeneration cutting to produce age and size mosaics. Failure to carry out subsequent thinnings, necessary to maintain tree vigor, could invite further attack.

6. Annosus Root Disease Management

During thinning for mountain pine beetle management, the resource manager has an opportunity to practice effective annosus root disease management by the use of a simple stump treatment. The most effective control for annosus root disease is prevention. The application of borax (sodium tetraborate decahydrate, EPA Reg. No. 1624-94) to all freshly-cut conifer stumps will prevent most new infections in the area. The borax should be applied according to label directions, including application as soon after felling as practical. Application immediately after cutting is most efficient. This treatment is required on all conifer stumps created in and around developed recreation sites (see FSM 2303 R-5 Supplement No. 126, and 2331.33 R-5 Supplement No. 90). Although the Prosser stands are not developed for recreation, the aesthetic value of the trees in this dispersed recreational setting may warrant annosus disease prevention.

From strictly a disease management point-of-view, application of borax would be the prudent course of action. Since the management objective for the stands is to maintain a vigorous and healthy tree cover, borax treatment now may prevent or greatly reduce any annosus root disease problems in the future stand. The efficacy between disease prevention now and the ineffective or costly control procedures after infection occurs needs to be considered. Management of active annosus centers developing 20 to 30 years from current thinning activities may be more costly than management of the mountain pine beetle problem now. However, several economic and biological factors also need to be considered.

a. The cost of borax treatment may be prohibitive. If 200 stumps per acre are created in the 87-acre area during thinning, and if a borax treatment cost of $1 per stump is assumed, the total cost for borax treatment would be $16,000.

b. A requirement for borax treatment would preclude opening the stands for fuelwood cutting by the public. Contracting the thinning operation, and requiring borax application in the contract, would probably add to the overall administrative costs of the project. Some of this increased cost may be offset by more efficient thinning operations by a commercial operator.

c. The number of annosus centers that may develop in the stands without borax treatment is unknown. Information from Region 5 and other areas in the West suggest that adverse impacts of annosus root disease in lodgepole pine stands is not common. This may be due to unfavorable edaphic conditions for the fungus (wet, heavy soils) in areas where lodgepole pines often grow, to the relative lack of management (creating stumps) in lodgepole pine stands, or to other factors. However, F. annosus is relatively common in the area on Jeffrey pine, the soils are, for the most part, moderately-to well-drained, and at

least some infection of lodgepole pine stumps would be expected. Although our knowledge of annosus infection in lodgepole pine is sketchy, it is known that stumps of the species are susceptible to spore infection, that losses from F. annosus in other pine species have increased as management increased, and that losses have been associated with stumps left from thinnings.

PEST BIOLOGIES

Annosus Root Disease

Fomes annosus is a fungus that attacks a wide variety of woody plants. All western conifer species are susceptible. Madrone (Arbutus menziesii), and a few brush species (Arctostaphylos spp. and Artemisia tridentata) are occasional hosts. Other hardwood species are apparently not infected. The disease has been reported on all the National Forests in California, with incidence particularly high on true fir in northern California campgrounds and on ponderosa and Jeffrey pines in the eastside pine type.

During periods favorable to the fungus, fruiting bodies (conks) form in decayed stumps, under the bark of dead trees, or under the duff at the root collar. New infection centers begin by aerial spread of spores produced by the conks and subsequent colonization of freshly cut stump surfaces or wounds on living trees. The fungus then spreads through root contacts into the root systems of adjacent live conifers. Local spread of the fungus from a stump typically results in the formation of a disease center, with dead trees in the center and fading trees on the margin. These centers usually continue to enlarge until they reach natural barriers such as stand openings or non-susceptible plants. The fungus may remain alive for as long as 50 years as a saprophyte in infested roots and stumps.

In pines, F. annosus grows through root cambial tissue to the root crown where it girdles and kills the trees. In less resinous species such as true fir, the fungus sometimes kills trees, but more frequently it is confined to the heartwood and inner sapwood of the larger roots where it causes a chronic butt and root decay and growth loss.

Mountain Pine Beetle

The mountain pine beetle, Dendroctonus ponderosae Hopkins, is the insect most destructive of lodgepole pine in California and western North America. Other hosts in the vicinity of Truckee are ponderosa pine, western white pine, sugar pine and whitebark pine. Infestations in lodgepole often become quiet extensive.

One generation per year is usual, but evidence in the Prosser stands indicates that a partial second generation may be present or that the emergence period extends into the autumn. A few live female adults were found at the end of short egg galleries that contained eggs and first stage larvae. These females were constructing what appeared to be either ventilation holes or points of exit. The viability of the eggs found could be questionable because larvae and adults are the usual overwintering stage. A small number of fresh pitch tubes also were found. It was assumed that these were late attacks that did not pitch profusely until spring.

Adults attack trees and lay eggs from June through August. Attacks are usually heaviest along the main trunk of a tree from dbh to mid-crown, but may extend the whole length of the tree. Adults bore 2' to 4' long vertical egg galleries in the phloem/cambium region, and lay eggs in niches along the sides of the gallery. At the bottom of the gallery where construction began is a hook shaped like a hockey stick. The hatching larvae feed in mines perpendicular to the main gallery, and construct small pupal cells at the end of these mines where they pupate and transform into adults.

Damage by the beetle is recognized by pitch tubes along the bole and red boring dust in bark crevices and on the ground. Foliage will fade from green to greenish yellow and eventually reddish brown. The rapidity of fading varies greatly — most pines attacked in 1985 retained their normal green color when the Prosser stands were examined in early May 1986.

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APPENDIX I

LABEL
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DOW*

DURSBAN* 4E

INSECTICIDE

Controls Numerous Pests of Households, Turf, and Ornamental Plants. Also Recommended for Mosquito Control and Area Control of Ticks and Chiggers.

To Be Applied Only By or Under the Supervision of Pest Control Operators, Public Health Organizations, Mosquito Abatement Districts, and Other Trained Personnel Responsible for Insect Control Programs

ACTIVE INGREDIENTS:	
Chlorpyrifos (O,O-diethyl O-(3,5,6-trichloro-2-pyridyl)phosphorothioate)	41.2%
Aromatic petroleum derivative solvent	29.5%
INERT INGREDIENTS	29.3%

Contains 4 pounds of chlorpyrifos per gallon.

E.P.A. Registration No. 464-360 **E.P.A. Est. 464-MI-1**

PRECAUCION AL USUARIO: Si usted no lee inglés, no use esta producto haste que la etiqueta le haya sido explicada ampliamente.
TRANSLATION: (TO THE USER: If you cannot read English, do not use this product until the label has been fully explained to you.)

KEEP OUT OF REACH OF CHILDREN

WARNING

MAY BE FATAL IF SWALLOWED • MAY BE ABSORBED THROUGH SKIN • MAY BE INJURIOUS TO EYES AND SKIN • COMBUSTIBLE

Do Not Take Internally • Do Not Get in Eyes or on Skin • Wash Thoroughly After Handling Wash Contaminated Clothing Before Reuse • Flush Contaminated Eyes with Plenty of Water and Get Prompt Medical Attention • Avoid Breathing Vapors and Spray Mist • Avoid Spraying Food Crops • Keep Away from Food, Feedstuffs, and Domestic Water Supplies Keep Container Closed • Do Not Use, Pour, Spill, or Store Near Heat or Open Flame • Do Not Cut or Weld Container • Handle Concentrate in a Ventilated Area

Note to Physician: Chlorpyrifos is a cholinesterase inhibitor. Treat symptomatically. Atropine is an antidote.

In case of an emergency endangering life or property involving this product, call collect **517-636-4400**	**AGRICULTURAL CHEMICAL** Do Not Ship or Store with Food, Feeds, Drugs or Clothing

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Pests Out-of-Doors

General Information: Use DURSBAN 4E for control of certain pests of lawns and ornamental plants, for area control of ticks and chiggers and for mosquito control. Consult the following directions for dosage and application details to control the pests listed.

Pests of Lawns and other Ornamental and Recreational Turf Grass Areas: Use DURSBAN 4E to control the pests listed in the following table by application at the recommended dosages and in accordance with the directions given below. Dilute DURSBAN 4E in enough water to obtain complete and uniform coverage of pest infested areas and apply as a coarse, low-pressure spray using suitable application equipment; Thoroughly water immediately after treatment to wash the insecticide into the turf, except as noted. For best results, the lawn should be moist at time of treatment.

ENVIRONMENTAL AND USE PRECAUTIONS

This product is highly toxic to bees exposed to direct treatment or residues on plants. Protective information may be obtained from your Cooperative Agricultural Extension Service.

DURSBAN 4E is toxic to fish, birds, and other wildlife. Keep out of lakes, streams, ponds, tidal marshes and estuaries. Shrimp and crabs may be killed at application rates recommended on this label. Do not apply where these are important resources. Do not apply where runoff is likely to occur. Do not apply when weather conditions favor drift from areas treated. Do not contaminate water by cleaning of equipment, or disposal of wastes. Apply this product only as specified on this label.

Do not reuse empty container. Destroy it by perforating or crushing. Bury or discard in a safe place away from water supplies.

NOTICE: Seller warrants that the product conforms to its chemical description and is reasonably fit for the purposes stated on the label when used in accordance with directions under normal conditions of use, but neither this warranty nor any other warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE, express or implied, extends to the use of this product contrary to label instructions, or under abnormal conditions, or under conditions not reasonably foreseeable to seller, and buyer assumes the risk of any such use.

DOSAGES and DILUTIONS for USE on ORNAMENTAL PLANTS

Pests Controlled		Amount of DURSBAN 4E in Water to Make		
		3 gallons	10 gallons	100 gallons
Aphids Bagworms Eastern tent caterpillar Fall webworm Grasshoppers	Mites Orangestriped oakworm Spittlebugs Whiteflies Yellownecked caterpillar	0.25 fl. oz.	0.8 fl. oz.	0.5 pint†
Cutworms Leafhoppers Mealybugs	Mimosa webworm Redhumped caterpillar Thrips (exposed)	0.5 fl. oz.	1.6 fl. oz.	1 pint††
Ash borer Lilac borer	Scale crawlers: Oak lecanium Pine needle Tea White peach	1.0 fl. oz.	3.2 fl. oz.	1 quart†††

†Equivalent to 4 ounces of chlorpyrifos per 100 gallons
††Equivalent to 8 ounces of chlorpyrifos per 100 gallons.
†††Equivalent to 1 pound of chlorpyrifos per 100 gallons.

Pests of Ornamentals: Use DURSBAN 4E to treat flowers, shrubs, vines, shade and flowering trees, and evergreens found to be infested with the pests listed in the following table. Dilute DURSBAN 4E with water according to directions given in the table and apply using suitable hand or power spray equipment in a manner to provide complete and uniform coverage. For best results apply a wetting spray to both upper and lower leaf surfaces and infested limb and trunk areas. Attempt to penetrate dense foliage but avoid overspraying to the point of excessive runoff. Treat when pests appear and repeat at 7- to 10-day intervals, if needed. Note — Do not use on azaleas, camellias, poinsettias, rose bushes, or variegated ivy because of possible injury to these plants.

Note: Mosquitoes coming to rest on areas treated for control of turf and ornamental plant pests will be killed for varying periods of time after treatment, depending on exposure of treated areas to weathering conditions.

Attention (Lawn and Ornamental Plant Pests): **Keep children and pets off treated areas until spray has dried. Keep out of lawn and garden fishpools and other bodies of water.**

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DEPARTMENT OF FOOD AND AGRICULTURE
1220 N Street, Room A-151
Sacramento 95814

September 21, 1981

REGISTRATION FOR SPECIAL LOCAL NEED
FOR DISTRIBUTION AND USE ONLY WITHIN CALIFORNIA

Trade Name: Dursban 4E EPA Reg. No. 464-360
Firm Name: The Dow Chemical Company

DIRECTIONS FOR USE
It is a violation of Federal law to use this product
in a manner inconsistent with its labeling.

Location: San Bernardino and Riverside Counties
Crop/Site/Commodity: Felled, infected conifers
Target Pest/Problem: Bark beetles and borers
Dosage: 2% chlorpyrifos spray on bark to wet thoroughly to the point of runoff.
Dilution Rate: 5-1/3 fluid ounces of product per gallon of diluent for water-base spray, or 4 fluid ounces per gallon for oil-base spray.
Method of Application: spot treatment with hand sprayer
Frequency/Timing of Application: one application after infested trees are felled.
Field Reentry After Application: until spray dried
Preharvest Interval: N/A
Other Requirements: none
Expiration Date: September 21, 1986

All applicable directions, restrictions, and precautions on the EPA-registered label(s) are to be followed.

This labeling must be in the possession of the user at the time of pesticide application.

Authorization must be obtained from the county agricultural commissioner prior to this use. This does not constitute a recommendation of the Department of Food and Agriculture and will not prevent quarantine action if illegal residues are found on or in the crop. Neither the Department nor the county agricultural commissioner, the manufacturer or formulator makes any warranty of merchantability, fitness of purpose, or otherwise, expressed or implied, concerning the use of a pesticide in accordance with these provisions. The user and/or grower acknowledges the preceding disclaimer and accepts liability for any possible damage resulting from this use. Do not use in mixture with other pesticides unless provided for in the labeling. Trial on a small area to check out unanticipated problems is suggested.

24(c) Registrant: California Department of Forestry
EPA SLN No.: CA 810065

George A. Reese, Chief
Pesticide Registration and
Agricultural Productivity
(916) 322-5130

USE AUTHORIZED BY _____ Date _____

USER'S SIGNATURE _____

Mountain Pine Beetle.

What it's doing and how to control it.

The mountain pine beetle is one of the most destructive forest insects in western North America. And for western home owners, the fight is on to save older and larger, high-value pine trees.

In mature stands of western white, sugar and ponderosa pine, the mountain pine beetle attacks single trees or small groups, and the tree killing takes place over a fairly long period of time.

In second-growth stands of the same species, especially where trees are dense, groups of several hundred trees may be killed in one season. Outbreaks in lodgepole pine are usually confined to stands containing some trees of large diameter.

Harvesting stands and keeping trees less than 80 years of age is one solution to the mountain pine beetle threat, but it isn't practical for most home owners. A once-yearly preventive insecticide program is a practical solution.

SEVIMOL® 4 carbaryl insecticide helps stop the mountain pine beetle and save your pine trees. This free-flowing liquid blend, containing SEVIN® and molasses, features simple measurement and no premixing. SEVIMOL is compatible with most commonly used miticides, insecticides and fungicides. And it's the first registered preventive treatment.

Use on herbaceous and annual plants (carnation, chrysanthemum, gladiolus, peony, zinnia, etc.) to control:

Blister beetle	June beetle	Mealy bug
Boxelder bug	Lace bug	Plant bug
Flea beetle	Leafhopper	Psyllid
Japanese beetle	Leafroller	Rose aphid
Thrips (exposed)		

Use on shrubs, trees and woody plants (ash, arborvitae, azalea, barberry, beech birch, boxwood, catalpa, cedar, cypress, dogwood, elm, euonymus, hackberry, ginkgo, hawthorn, holly, honeysuckle, hydrangea, juniper, lilac, magnolia, maple, oak, pine, redbud, rose, tuliptree, etc.) to control:

Apple aphid	Bagworm	Birch leaf miner
Boxelder bug	Boxwood leaf miner	Cankerworm
Catalpa sphinx	Cooley spruce gall aphid	Eastern spruce gall aphid
Elm leaf aphid	Elm leaf beetle	Elm spanworm
Eriophyid mites	Gypsy moth	Japanese beetle
June beetle	Lace bugs	Leafhopper
Leafroller	Mealy bug	Oak leaf miner
Orange striped oakworm	Orange tortrix	Periodical cicada
Pine sawfly	Puss caterpillar	Plant bug
Rose aphid	Rose-slug	Scale insects
Spruce needle miner	Tent caterpillar	Thorn bug
Thrips (exposed)	Webworms	Willow leaf beetle
Yellow poplar weevil		

STOP! ALL PESTICIDES CAN BE HARMFUL TO HEALTH AND THE ENVIRONMENT IF MISUSED. READ THE LABEL CAREFULLY AND USE ONLY AS DIRECTED.

SEVIMOL®

CARBARYL INSECTICIDE

IS THE ANSWER.

SEVIN and SEVIMOL are registered trademarks of Union Carbide Corporation for carbaryl insecticide.

UNION CARBIDE CORPORATION
Agricultural Products Division
7825 Baymeadows Way
Jacksonville, FL 32216

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1978 F46965

SEVIMOL®

CARBARYL INSECTICIDE

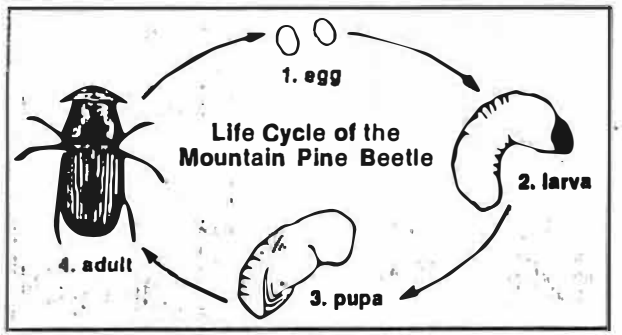
mountain pine beetle control guide

For use in California, Colorado, Idaho, Oregon, Montana and Washington.

Also controls a number of other pests on trees and shrubs.

SEVIMOL®
CARBARYL INSECTICIDE

The only currently registered preventative treatment for mountain pine beetle.



1. Minute, pearly-white eggs are laid by swarming adult females in mid-August.
2. They soon hatch into yellowish-white, legless larvae, which form galleries as they feed on the tree's cambial area and inner bark. The larvae go dormant during the winter months, but in late spring they break dormancy and continue feeding in the cambial area.
3. Mature larvae excavate shallow oval cells in the inner bark, where they change into pupa around June, and then, into young adults.
4. Newly formed adults are yellowish-white at first. They turn tan to brown, then black at maturity. Mature adults measure 1/8 to 1/5-inch long.

Signs of Infestation

Pitch tubes on the tree trunk mark the places where attacking beetles have entered. Boring dust (frass) in bark crevices and on the ground at the base of the tree is another sign of infestation.

A few weeks after infestation, fungi (carried by the beetles) stain the wood blue just beneath the bark. Pine needle color gradually changes from green to deep reddish-brown and eventually the needles fall off.

Natural Control

Woodpeckers and other predators, nematodes, tree vigor and prolonged or abnormally cold weather often help reduce populations of mountain pine beetles. But natural controls alone are not reliable.

Cultural practices

Mountain pine beetle attacks can be reduced by removing trees damaged by lightning and windthrown timber—especially in old-growth virgin stands.

Prevention Program

SEVIMOL carbaryl insecticide is the only currently labeled preventive treatment for mountain pine beetle. And, SEVIMOL can also be used to provide protection against several other shade tree and ornamental pests.

SEVIMOL is biodegradable, and when compared with many other commonly used insecticides, SEVIMOL ranks low in toxicity to people, farm animals, birds and fish.

DIRECTIONS FOR USE

For mountain pine beetle control:

*Use 1 gallon of SEVIMOL carbaryl insecticide in 23 gallons of water (1 pint in 3 gallons water) to make a spray mixture containing 2% active ingredient. Apply 1 gallon of this spray mixture to 50 square feet of pine tree bark surface in late May to early July** as a preventive treatment. Spray the pine tree trunks from ground level to a height at which the trunk diameter is 5 inches or less. Apply once annually, before the flight of young adults (anywhere from late May to early July) to prevent mountain pine beetles from infesting healthy pine trees.

Cut and remove all infested pine trees to further aid in the control of these beetles and prevent their spread to healthy trees.

*Currently labeled for use in California, Colorado, Idaho, Montana, Oregon and Washington. (In California, SEVIMOL also controls western pine beetle, using same rate and method of application as mountain pine beetle.)

**Consult the Cooperative Extension Service or forestry agency for more specific application timing.

Shade Tree and Ornamental Insect Control

Use 1 qt. per 100 gals. of water (1 tablespoonful per gal.) when insects or their damage appear. Repeat weekly or as needed.

Use 1 to 2 qts. per 100 gals. for control of eriophyid mites. In dilute applications the addition of an emulsifiable horticultural oil may enhance the control of eriophyid mites. Carbaryl injures Boston Ivy and Virginia Creeper.

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UNION CARBIDE

SEVIMOL 4 Carbaryl Insecticide for mountain and western pine beetles on pine
(EPA Reg. No. 1016-68)

PRODUCT BULLETIN

FOR DISTRIBUTION AND USE ONLY WITHIN CALIFORNIA

Product Bulletin:	SEVIMOL 4 Carbaryl Insecticide (EPA Reg. No. 1016-68)
Pests:	Mountain and western pine beetles
Crop:	Pines
Amount To Use:	Use 1 gallon of SEVIMOL 4 in 23 gallons of water (1 pint in 3 gallons of water) to make a spray mixture containing 2% active ingredients.
Directions For Use:	Effective as a preventative treatment only. Repeat annually as required to prevent beetle attacks.
	Apply 1 gallon of spray per 50 square feet of bark in late May to early July. Treat tree trunks from ground level up, until trunk diameter is less than 5 inches.
	Cut down and remove all dead or infested pine trees to further aid in the control of these beetles and prevent their spread to healthy trees.

It is a violation of Federal law to use this product in a manner inconsistant with it's labeling.

All applicable directions, restrictions, and precautions on the EPA-registered label(s) are to be followed.

EPA Establishment Number

EPA SLN No. CA 770318

USE PRECAUTIONS:

Avoid contamination of feed and foodstuffs. Do not use on household pets or humans. Keep out of reach of children. Do not use on feed or forage to be fed to dairy animals or to animals being finished for slaughter.

This product is toxic to fish and wildlife. Keep out of any body of water. Apply this product only as specified on this label. Birds and other wildlife in treated areas may be killed.

This product is highly toxic to bees exposed to direct treatment or residues on crops. Protective information may be obtained from your Cooperative Agricultural Extension Service.

DO NOT APPLY WHEN WEATHER CONDITIONS FAVOR DRIFT FROM AREA TREATED. DO NOT CONTAMINATE WATER BY CLEANING OF EQUIPMENT, OR DISPOSAL OF WASTES.

DO NOT ALLOW THIS PRODUCT TO DRIFT FROM AREA BEING TREATED.

NOT FOR USE OR STORAGE IN OR AROUND THE HOME.

DO NOT USE, POUR, SPILL OR STORE NEAR HEAT OR OPEN FLAME.

DIRECTIONS FOR USE:

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Rinse equipment and containers and dispose of wastes by burying in non-crop lands away from water supply. Containers should be disposed of by punching holes in them and burying with wastes.

USE DESIGNATED AMOUNT OF PRODUCT IN THE FOLLOWING GALLONS WATER PER ACRE UNLESS OTHERWISE NOTED:

GROUND APPLICATION: Vegetable Crops: 30 to 250 gals.

Where Recommended for AIR APPLICATION: Vegetable Crops: 3 to 10 gals.

CONTINUED ON REVERSE SIDE

red-top

LINDANE 1.7 SPRAY

ACTIVE INGREDIENT:	
Lindane (gamma isomer of benzene hexachloride)	**20%**
Xylene Range Aromatic Solvent	**75%**
INERT INGREDIENTS:	**5%**
	100%

Contains 1.7 lbs. Lindane per gal.

KEEP OUT OF REACH OF CHILDREN!

WARNING:

WARNING: May Be Fatal If Swallowed! May Be Absorbed Through Skin! Avoid breathing ing spray mist. Avoid contact with skin and eyes. In case of contact, wash immediately with soap and water; for eyes flush with water and get medical attention.

EPA Est. 2935-CA-1 F-676 EPA Reg. No. 2935-377-AA

WILBUR-ELLIS COMPANY

FRESNO • LOS ANGELES • GLENDALE, ARIZ. • PORTLAND • SEATTLE

SPECIMEN LABEL

RECOMMENDATIONS FOR USE:

BARK BEETLES: For the control of DOUGLAS-FIR BEETLE, WESTERN PINE BEETLE, AND MOUNTAIN PINE BEETLE on Douglas-Fir, White Fir, California Red Fir, Ponderosa Pine, Sugar Pine, Coulter Pine, Monterey Pine and Digger Pine. Mix 1 gallon in 15 gallons of diesel fuel oil or water and apply at the rate of 1 ½ gallons diluted mixture to approximately 235 sq. ft. of total bark surface area. Apply 1 week before adult beetles begin to emerge. Accurate, uniform application is most important to the success of the control effort. Application to runoff is wasteful and unnecessary. Hold the nozzle between 1 and 1 ½ feet from the bark while applying the spray.

BROCCOLI, BRUSSELS SPROUTS, CABBAGE, CAULIFLOWER & KALE: Use 1 qt. per acre to control APHIDS, SOUTHERN CABBAGE WORMS & THRIPS. Do not apply after edible parts start to form,

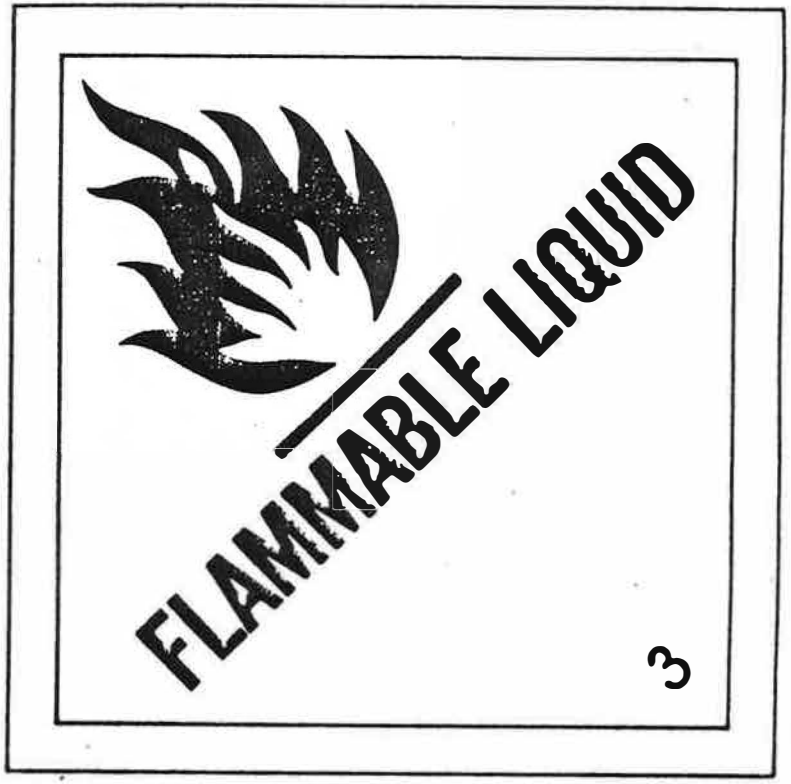
CELERY, PEPPERS & TOMATOES: Use 1 ½ pts. per acre to control APHIDS, THRIPS, CLIMBING CUTWORMS, LEAFMINERS, FLEA BEETLES & CUCUMBER BEETLES. Do not apply after the Celery is half grown or after it begins to bunch. Do not apply to Peppers after the edible parts start to form. Do not apply to Tomatoes after the fruit starts to form.

EGGPLANTS: Use 2 pts. per acre to control APHIDS, LEAF MINERS & FLEA BEETLES. Do not apply after the edible parts start to form.

LETTUCE & SPINACH: Use 2 pts. per acre to control APHIDS, CUTWORMS, LEAFMINERS, THRIPS, WEBWORMS & FLEA BEETLE. Do not apply to leaf lettuce after the seedling stage. Do not apply to head lettuce after the heads start to form. Do not apply to Spinach after seedling stage.

ONIONS: Use 4 pts. per acre to control THRIPS. Do not apply to green or spring onions.

NOTICE: The statements made on this label, are believed to be true and accurate, but because of conditions of use which are beyond our control, WILBUR-ELLIS COMPANY does not make, nor does it authorize any agent or representative to make, any warranty, guaranty or representation, express or implied, concerning this material or the use thereof, except in conformity with the statements on the label. Neither WILBUR-ELLIS COMPANY nor the seller shall be held responsible in any manner for any personal injury or property damage or loss resulting to the buyer or to the other person from handling, storage or use of this material, not in accordance with directions. The buyer assumes all risk and liability resulting from improper handling, storage or use and accepts and uses this material on these conditions.



FLAMMABLE LIQUIDS, N. O. S.

red-top
FARM CHEMICALS

AGRICULTURAL CHEMICAL DIVISION OF
WILBUR-ELLIS COMPANY

PRODUCT BULLETIN

RED-TOP LINDANE 1.7 SPRAY

FOR USE IN CALIFORNIA ONLY

For control of Mountain Pine Beetle on Lodgepole Pine, Jeffery Pine Beetle on Jeffery Pine, California Flatheaded Borer on all species of pine and Ips spp. on all species of pine, use 1 gallon of Red-Top Lindane 1.7 Spray in 15 gallons of water.

Do not spray this product on any conifer foliage when mixed in oil.

Observe all precautionary statements on label.

5/5/72

No. 76

RECOMMENDATIONS FOR USE:

BARK BEETLES: Mix 1 gallon in 15 gallons of diesel fuel oil and apply at the rate of 1½ gallons diluted mixture to approximately 235 sq. ft. of total bark surface area. Apply 1 week before the adult beetles begin to emerge. Accurate, uniform application is most important to the success of the control effort. Application to runoff is wasteful and unnecessary. Hold the nozzle between 1 and 1½ feet from the bark while applying the spray.

CAUTION: NON-EMULSIFIABLE: Do not mix with water unless adding special emulsifier recommended for this purpose.

DO NOT ALLOW THIS PRODUCT TO DRIFT FROM THE AREA BEING TREATED.

EPA Est. 2935-CA-1

F-374

red-top

LINDANE 20 SPRAY

COMPOSITION:

ACTIVE INGREDIENT:	
Lindane (gamma isomer of benzene hexachloride)	**20%**
INERT INGREDIENTS:	
Xylene	**80%**
TOTAL	**100%**

EPA Reg. No. 2935-235

WARNING: **KEEP OUT OF REACH OF CHILDREN!**

(Also See Side Panel For Additional Warnings.)

Do not use, pour, spill or store near heat or open flame.

Not for use or storage in or around the home.

WILBUR-ELLIS COMPANY

FRESNO LOS ANGELES GLENDALE PORTLAND SEATTLE

CONTINUED ON REVERSE SIDE

WARNING: May be fatal if swallowed! May be absorbed through skin! Avoid breathing spray mist. Avoid contact with skin and eyes. In case of contact, wash immediately with soap and water; for eyes flush with water and get medical attention. Avoid contamination of feed and foodstuffs. Do not use on household pets or humans. Keep out of reach of children. Do not use on feed or forage to be fed to dairy animals or to animals being finished for slaughter.

This product is toxic to fish and wildlife. Keep out of any body of water. Apply this product only as specified on this label. Rinse equipment and containers and dispose of wastes by burying in non-crop lands away from water supplies. Containers should be disposed by punching holes in them and burying with wastes, or burning (keep out of smoke).

To be used by Federal or State agencies engaged in Bark Beetle control work.

NOTICE: The statements made on this label, are believed to be true and accurate, but because of conditions of use which are beyond our control, WILSUR-ELLIS COMPANY does not make, nor does it authorize any agent or representative to make, any warranty, guaranty or representation, express or implied, concerning this material or the use thereof, except in conformity with the statements on the label. Neither WILSUR-ELLIS COMPANY nor the seller shall be held responsible in any manner for any personal injury or property damage or loss resulting to the buyer or to the other person from handling, storage or use of this material, not in accordance with directions. The buyer assumes all risk and liability resulting from improper handling, storage or use and accepts and uses this material on these conditions.

red-top
FARM CHEMICALS

AGRICULTURAL CHEMICAL DIVISION OF
WILBUR-ELLIS COMPANY

PRODUCT BULLETIN

RED-TOP LINDANE 20 SPRAY

FOR USE IN CALIFORNIA ONLY

For the control of Western Pine Beetle on Ponderosa Pine, Mountain Pine Beetle on Sugar, Lodgepole and Ponderosa Pine, Jeffery Pine Beetle on Jeffery Pine, California Flatheaded Borer on all species of pine and Ips spp. on all Species of pine, use 15 gallons of diesel fuel oil.

Do not spray this product on any conifer foliage when mixed in oil.

Observe all precautionary statements on label.

BORAX FOR FOMES ANNOSUS CONTROL

ACTIVE INGREDIENT:

Sodium Tetraborate Decahydrate.....($Na_2B_4O_7.10H_2O$)... 100.00%

(Boric Oxide (B_2O_3) Equivalent ... 37.50%)

FOR CONTROL OF FOMES ANNOSUS IN PINE AND FIR STANDS

It has been esteblished that the fungus, Fomes annosus, often infects cut conifer stumps following thinning or cutting operations, and that the fungus can spreed from infected stumps to residual trees in the stand.

Several chemical agents have been used to limit the development of Fomes annosus. Research has shown that Borax prevents establishment and growth of Fomes annosus in cut stumps of pine and fir. Borax, a granular, technical chemical, is widely available from distributors of industrial chemicals. It offers a low-cost, convenient, and safe method of limiting losses to Fomes annosus.

Before using Borax for stump treatment control of Fomes annosus infection, contact local, State or Federal Forest Service authorities to verify most economical and efficient methods and materials for your situation.

DIRECTIONS FOR USE

Use of Borax for this purpose is limited to pines in the Eastern States; in California and adjacent areas of Nevada, to pines, true firs, and associated conifers occuring in the stand being treated.

Borax should be apolied to stump surface of the cut tree as soon after felling as practicable. For most efficient use, apply immediately after cutting but do not delay treatment more than two days.

Best method of application is to sprinkle material "salt-shaker" style on the freshly cut stump surface. Complete coverage, including exposed side areas and any splinters, is necessary. "Shaker-top" applicators are available in most farm and garden shops in one or two-pound sizes.

Apply only enough Borax to lightly cover stump surface. At proper rates of application, one pound of granular Borax will adequately cover 50 square feet of stump surface; that is, 260 six-inch stumps, 158 eight-inch stumps, 80 ten-inch stumps, or 60 twelve-inch stumps.

Moisture in the exposed wood from freshly cut stumps, dew, or rain, will dissolve the Borax and leach it into the wood.

CAUTION: KEEP OUT OF REACH OF CHILDREN

CAUTION: Use care and caution in handling and applying all posticides. May be harmful if swallowed. Follow directions and do not over apply, waste or spill. Do not store pesticides with feed or foodstuffs, or where children or animals may have access. Destroy all containers when empty. Multiwall paper containers in which Borax is packed may be burned when empty. Wash hands, face, and clothing after use.

Borax carelessly spilled or applied to cropland or growing plants — including trees and shrubs — may kill or seriously retard plant growth. Do not contaminate any body of water by direct application.

NOTICE

Because of many varying conditions affecting use and application, such as location, seasonal weather, soil composition and type of vegetation, manufacturer warns buyer that these and other conditions may impair or vary the results or effects of this product. In any event, complete elimination of Fomes annosus is not guaranteed. Neither manufacturer nor seller shall be liable in respect to any injury or damage suffered by reason of the use of this product for a purpose not indicated by the label or when used contrary to the directions or instructions hereon nor with respect to breach of any warranty not expressly specified herein. Buyer accepts this material subject to these terms, and assumes all risk of usage and handling except when used or handled in accordance with this label. Neither manufacturer nor seller makes, and their employees, and agents are not permitted to make, any representations or warranties, express or implied by law, not specifically set forth herein.

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A 20 MULE TEAM® Product USBORAX

A MEMBER OF THE RTZ GROUP

United States Borax & Chemical Corporation
3075 Wilshire Boulevard / Los Angeles, California 90010

NET WEIGHT: 100 lbs. EPA ~~U.S.D.A.~~ REG. NO. 1624-94

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